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September 26, 2006

Statement of
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Before the
Subcommittee on Space and Aeronautics
Committee on Science
U.S. House of Representatives

Mr. Chairman and Members of the Subcommittee, thank you for this opportunity to appear before you today to present NASA's new aeronautics research program. During the past year, NASA's Aeronautics Research Mission Directorate (ARMD) has undergone a comprehensive restructuring to ensure that we have a strategic plan in place that enables us to pursue long-term, cutting-edge research for the benefit of the broad aeronautics community.

Today, NASA's aeronautics research programs are positioned better than ever to provide meaningful and relevant research that is aligned with our National priorities. We are conducting high-quality, innovative, integrated research across the fundamental disciplines of aeronautics, creating revolutionary tools, concepts, and technologies that will lead to a safer, more environmentally friendly, and more efficient national air transportation system. At the same time, we are ensuring that aeronautics research and critical core competencies continue to play a vital role in support of the Vision for Space Exploration. Lastly, NASA's refocused aeronautics program is establishing strong partnerships with academia, industry and other Government agencies, and in doing so, we are ensuring that our world-class resources are readily available to them.

Guiding Principles

In restructuring NASA's aeronautics program, we were guided by three core principles: 1) we will dedicate ourselves to the mastery and intellectual stewardship of the core competencies of aeronautics for the Nation in all flight regimes; 2) we will focus our research in areas that are appropriate to NASA's unique capabilities; and, 3) we will directly address the fundamental research needs of the Next Generation Air Transportation System (NGATS) while working closely with our agency partners in the Joint Planning and Development Office (JPDO). It is important to emphasize that these principles are budget-independent, as they must be, in order to ensure consistency and stability of programmatic decisions over the long term.

Given the critical importance of these principles, I take the time here to elaborate on each in more detail, beginning with the first. NASA's ARMD does not have an operational mission. We do not build aircraft to defend our Nation or to sell in the commercial marketplace. We are not responsible for implementing the national air transportation system, nor do we build robotic and human spacecraft. Our role is to provide the wellspring of aeronautical knowledge for our partners in both the Government and private sector who are responsible for these missions. Therefore, we must and will pursue long-term, cutting-edge research in the core aeronautics disciplines across all flight regimes, in order to enable the quantum leaps in knowledge that lead to the development of revolutionary ideas, concepts, approaches, technologies, and capabilities that have broad applicability.

Regarding the second principle, we will not duplicate research being conducted in other agencies, nor will we conduct research that is the responsibility of other agencies. Furthermore, we will not conduct research that is more appropriately conducted in the private sector. Specifically, we will not conduct near-term, incremental research, nor will we conduct research that benefits only a small subset of industry. Our research will be pre-competitive, cutting-edge, and will benefit the community broadly. To that end, we intend to publish our research results to the greatest extent practicable in as timely a manner as possible.

The third principle speaks to our commitment to the NGATS vision as articulated by the JPDO. Here, it is important to realize that while Air Traffic Management (ATM) research is a vital component of the fundamental research that we will conduct in support of the NGATS vision, our commitment must and will extend beyond ATM research. Increasing the capacity of the ATM system by factors of two or three will be nothing more than a theoretical exercise if we do not simultaneously address the substantial noise, emissions, efficiency, safety, and performance challenges facing the air vehicles of the future. These are issues that cannot be worked in isolation – a holistic approach to vehicle design will be required in order to address multiple and often conflicting design requirements.

Given these three principles, we then established the four programs within ARMD: the Fundamental Aeronautics Program; the Aviation Safety Program; the Airspace Systems Program; and the Aeronautics Test Program. The Fundamental Aeronautics Program conducts cutting-edge research that produces concepts, tools, and technologies that enable the design of vehicles that fly through any atmosphere at any speed. The Aviation Safety Program is focused on developing revolutionary tools, methods, and technologies that will improve the inherent safety attributes of current and future aircraft that will be operating in the evolving National Airspace System (NAS). The Airspace Systems Program is directly addressing the fundamental ATM research needs of the NGATS. This research will yield revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of the NAS. The Aeronautics Test Program is ensuring the strategic availability and accessibility of a critical suite of aeronautics test facilities that are necessary to meet aeronautics, Agency, and National needs.

While each program focuses on a particular aspect of aeronautics research, the four programs interact closely with one another starting with the researchers at the NASA Research Centers all the way up the programmatic chain to Headquarters. A detailed summary of each program is provided in the supplementary material, which includes program and project overviews, key accomplishments in FY 2006, and partnerships that have been established or that are being developed with industry and other Government agencies.

From Strategic Vision to Implementation: Details about our Process

ARMD established a four-step approach to putting together technical plans in the ten aeronautics projects in our four aeronautics programs. The approach was designed to enable us to foster close collaboration with and to facilitate the exchange of ideas and information among researchers at NASA, industry, academia, and other Government agencies, in a manner that benefits the community broadly.

Last fall, we completed the first step, during which researchers at the four research Centers came together to develop preliminary ten-year roadmaps that included technical milestones for each project in each program. These roadmaps were vetted with our Government partners in the Department of Defense (DoD), Federal Aviation Administration (FAA), and JPDO in late 2005, and were then presented to the broad aeronautics community at the American Institute of Aeronautics and Astronautics conference in January 2006, while simultaneously being posted to our website. Our intent was to ensure full and open access to information, without providing any preferential access to particular companies or universities.

In January 2006, we began our second step by releasing a Request for Information (RFI), soliciting interest from industry for non-reimbursable cooperative partnerships in pre-competitive research that would allow NASA to leverage industry's systems-level expertise while facilitating the rapid transfer of knowledge and technology from NASA to industry. We received more than 230 responses from over 100 different organizations, many of which have already resulted in working collaborations.

Our third step was the internal proposal process. Using the preliminary roadmaps as a starting point, NASA researchers incorporated feedback from RFI respondents as well as from colleagues in other government agencies to develop refined technical proposals for each project. These proposals were then reviewed by panels of Government subject matter experts from the DoD, JPDO, FAA, and the National Oceanic and Atmospheric Administration. Proposals were evaluated based on their technical, management, resource, and partnership plans. Simultaneously, the management at the four NASA research centers conducted their own independent review of each proposal. Researchers were then provided detailed feedback from both reviews and used that feedback to further refine their proposals, which then underwent a second peer-review at NASA Headquarters. This rigorous proposal review process ensured that we had technically credible and relevant research objectives and a sound approach for pursuing these objectives. It also allowed us to identify foundational research areas where we needed to supplement our in-house capabilities with external expertise.

During the fourth and final step, we released a NASA Research Announcement (NRA) to solicit proposals from the external community in foundational research areas where NASA needs to enhance its core capabilities. NRA competition was full and open. One of the key objectives of our NRA investment is to stimulate close collaboration among NASA researchers and NRA award recipients to ensure effective knowledge transfer. The first round of proposals closed July 7, 2006. We are very pleased with the number and quality of proposals received and the diversity of submitting organizations. In the first evaluation round, we received more than 700 proposals from more than 110 universities and over 120 other organizations (companies and non-profits). More than 600 highly qualified technical and scientific experts from NASA and other organizations provided thorough reviews of these proposals. We hope to have awards in place by October and November 2006. Additionally, the NRA will remain open to enable us to conduct another round of proposal evaluations.

In summary, ARMD has sought input from all aeronautics stakeholders during its reorganization process, and we did so in a manner that did not provide preferential access to information or opportunities for collaboration to any particular company or university. Our research is paid for by the American public, and therefore we are obligated to provide aeronautics research that benefits the community broadly. Narrowing our research focus to the needs of a small subset of companies runs counter to our mission and counter to the Nation's best interests. Therefore, we are actively seeking participation from all aeronautics stakeholders during our restructuring and are establishing close collaborations with both large and small companies.

Aeronautics and Space Exploration

I would like to directly address the misperception by some individuals who believe that support for the Vision for Space Exploration has resulted in a decline in the Agency's commitment to aeronautics research. Quite the contrary, aeronautics research has a critical role to play in the Vision.

Aeronautics research and space exploration are inextricably linked. The X-15 program provides a great historical example of the essential contributions that aeronautics research has made to our Nation's successful space exploration activities. By contrast, the recent gap-filler incident on STS-114 shows what happens when aeronautics research fails to provide the fundamental knowledge and understanding needed to address emergent issues across all flight regimes. When the concern arose whether high speed air flowing over a protruding "gap filler" on the Shuttle could cause excessive heating during re-entry, we did not have sufficient data or analysis capability to provide a timely, decisive answer. As such, we were forced to conduct an unplanned and somewhat risky space walk to remove the gap filler.

Our future space exploration efforts are critically dependant upon advancing our state of knowledge in aeronautics. The STS-114 Shuttle flight served as a potent reminder that the first and last 100 miles of any journey from Earth to lower-Earth orbit, the Moon, or Mars and back is through the Earth's atmosphere. We must also remember that the atmosphere of Mars is approximately 60 miles thick, and its properties present a daunting challenge for safely landing large payloads. It is thick enough to cause severe heating challenges but thin enough to make deceleration extremely difficult. Therefore, we will need to greatly advance our fundamental understanding in key aeronautics disciplines such as aerodynamics, aerothermodynamics, materials, and structures, across all flight regimes from subsonic through hypersonic, in order to advance our capabilities for safe flight through any atmosphere, be it our own, or that of another planet.

NASA Discusses Issues Raised During July 18th House Aeronautics Subcommittee Hearing

On July 18, 2006, Members of this Committee held the first of two hearings about NASA's efforts to reshape its aeronautics research and development program. I was unable to testify at that hearing, but am happy to be here today to address some of the issues and concerns raised by witnesses and Members during that first hearing.

Today, there are four key topics of concern to the Committee that I would like to address, the first of which is the National Research Council's Decadal Survey of Civil Aeronautics.

1) The Decadal Survey of Civil Aeronautics

Although the Decadal Survey of Civil Aeronautics was sponsored by ARMD, it was conducted completely independently of the restructuring activities occurring within ARMD. That said, the 51 Technical Challenges and five Common Themes identified in the report are closely aligned with ARMD's restructured research portfolio. For example, the common themes of physics-based analysis tools and multidisciplinary design tools are present across all of our projects. We strongly agree with the report's findings that state that "an important benefit of advances in physics-based analysis tools is the new technology and systems frontiers they open. New concepts often emerge from a greater understanding of the underlying physics offered by new analytical capabilities. NASA, industry, and academia can jointly participate in research into physics-based analysis tools because it is fundamental in nature, publishable, and sharable. This research will take time to mature, yet advances can readily be translated into practice as they occur." We also strongly agree with their comments regarding multidisciplinary design tools: "The next step in the design of more complex systems involves more than just…gluing together discipline-specific analyses and optimization. New multidisciplinary tools are needed to integrate high-fidelity analyses with efficient design methods and to accommodate uncertainty, multiple objectives, and large-scale systems…"

Regarding the theme of advanced configurations, we agree that the pursuit of advanced configurations, such as revolutionary aircraft concepts and advanced structural designs, can foster the implementation of innovative solutions to systems-level challenges. In fact, across our research portfolio, our focus on physics-based, multidisciplinary design, analysis, and optimization tools with quantified levels of uncertainty will enable virtual expeditions through design space in order to identify advanced configurations that have the greatest possibility of meeting multiple and often conflicting system-level requirements. Regarding the intelligent and adaptive systems theme, which "encompasses aircraft-level challenges aimed at sensing the operational environment, actively responding to that environment, and learning from the resulting interactions," our Aviation Safety Program also embraces this as an important theme. Finally, we agree that the "air transportation system must be understood as a complex interactive system", and we agree with each of the systems issues identified under that theme, and with the cautionary statement that “system models typically examine isolated effects or components within the system, and few models attempt to examine a large range of complex, interactive system effects, especially those involving nondeterministic behaviors.”

However, we would like to clarify one issue raised in the report -- the claim that ARMD spends 93 percent of its funds in-house, implying that 93 percent of our funds pay for civil servants. In reality, $180 million of NASA’s FY 2007 aeronautics budget request would pay for out-of-house to support our research programs. Of that total, about $50 million would pay for research awarded under the NRA. The remainder of the out-of-house dollars, about $130 million, would pay for on-site research contractors (contracts are competitively awarded), hardware/software procurements, wind tunnel fabrications, JPDO procurement funds and HQ studies such as the Decadal Survey. None of the $180 million would pay for NASA civil servants.

Lastly, I would like to reiterate that NASA intends to fully comply with a statutory requirement to conduct two National Research Council studies by Dec. 31, 2007.

2) Fundamental research vs. demonstration projects

The second topic I would like to address is NASA’s decision to focus on fundamental aeronautics research instead of point-design demonstration projects. There are three points I would like to make regarding this topic:

First, it is important to understand that aircraft design is perhaps the ultimate art of compromise. Every aircraft is an integrated system representing a balance and compromise between conflicting requirements: it is a lesson as old as the Wright brothers. Indeed, the modern discipline of system engineering has its roots in the design of aerospace vehicles. Since aircraft of the future must continue to address multiple and usually conflicting design challenges such as noise reduction, emissions, fuel efficiency, and performance, addressing any one independently of the others will lead to partial solutions at best, and at worst, solutions that are misleading or ineffective. For example, focusing a significant amount of investment on a large-scale demonstration to “reduce noise by 50 percent relative to what the state-of-the-art was in 1997” (a demonstration project that was proposed in early 2005) will almost certainly yield solutions that are optimized for noise reduction at the expense of other critical system attributes. Reducing noise at the expense of performance or fuel efficiency, for example, is unlikely to provide a viable economic alternative to existing approaches. Revolutionary improvements in the capabilities of future aircraft must incorporate an integrated approach to aircraft design, which in turn necessitates a commitment to research that cuts across multiple disciplines such as aerodynamics, combustion, acoustics, materials, and flight controls.

Second, it is critical to understand that a demonstration is not an experiment. A demonstration sets out to prove that something works. An experiment, in contrast, sets out to pursue technical truth. These are very different goals. In a school setting, for example a high school or college physics or chemistry class, a demonstration can be extremely useful to teach students an already known truth. But this is a very different matter than undertaking fundamental research, where we are dealing not with knowns, but with unknowns—in short, the “X factor” that is inherent in the X series that have taken this nation from subsonic airplanes to hypersonic craft operating into space. Every airplane flying today demonstrates the basic principles of flight. But every day, at NASA’s research centers, we are advancing our comprehension of those principles by probing the unknown via the scientific method. This is more than mere semantics; it is the fundamental thing that sets a research program apart from a demonstration. And there is another danger as well. If we think we already know the answer to a question, and we set out to prove that we are right, then we have forfeited our objectivity and have become advocates for a particular approach or technology. NASA’s aeronautics programs must be conducted so as to provide objective and unbiased assessments, and such objectivity is compromised once one defines “success” as being “right”.

In the 1930's everyone "knew" the answer to future propulsion needs: bigger and better piston engines. Many advances in the state of the art for such engines were demonstrated. But it was in Britain and Germany where the next crucial steps in aviation were taken, through experiments with—not demonstrations of—jet and rocket engines. We must never find ourselves in such a position again.

Let us explore the implications of such thinking in today's world. Let's say, for example, that our research leads us to the discovery of a new concept for a device that we estimate could reduce the noise output from an engine by 20 percent. A demonstration (whether on the ground or in the air) would be designed to prove that the device does indeed reduce noise output by at least 20 percent. In other words, advocacy for the device becomes the goal of the demonstration and proof that the device works as predicted becomes the metric for success. There would be a limited number of runs, and the parameters would be chosen to ensure a high probability that the device meets or exceeds predicted performance. However, even if the demonstration is a "success", the results will have limited applicability, because it is just as important to know when the device fails to perform, and to try to understand why, in order to be able to use it effectively. But failure of the device runs counter to the objectives of a demonstration.

An experiment, on the other hand, would be designed to test the device across as broad a test regime as possible and to make careful measurements, with quantifiable error bars, to characterize its performance as fully as possible. The device would not be required to reduce noise output by 20 percent in order for the experiment to be considered a success, because the goal of the experiment is truth. Rather, the results would be useful to the broad community because the data would enable the entire community to understand the capabilities and limitations of the device, whatever they may be.

Third, some critics have assumed that NASA's decision not to expend our resources on large-scale point-design demonstrations equates to turning away from X-vehicle research. This criticism is based on a misunderstanding of what X-vehicles are designed to do. X-vehicles are not demonstrators; they are research aircraft. They were originally developed as research tools, with the sky as a laboratory. For example, the first X-vehicle, the X-1, was the result of a NACA/Air Force partnership that produced the first high-speed aircraft built solely for aviation research purposes. That it was not a mere demonstrator is evidenced by one of its design requirements: the plane carried hundreds of pounds of research instrumentation, including real-time telemetry, so that researchers could unlock the secrets of transonic and supersonic flight. All told, 157 test flights were conducted during the original X-1 program, and the knowledge generated from those flights was instrumental in enabling us to design supersonic fighter jets and transonic jet airliners alike. The X-15 program, which was a NACA/NASA, Air Force, and Navy partnership, performed 199 test flights and yielded over 750 technical publications. The knowledge produced by the X-15 program was critical in the development of re-entry and launch vehicles, including the Space Shuttle. Contrary to what some have claimed, NASA sees great value in X-vehicles, and anticipates continuing such partnerships with the DoD. For example, NASA is currently partnering with the DoD on the X-51 hypersonics program -- a program that is building upon the results from the X-43A program. Ground testing of the X-51 engine will begin at NASA's Langley Research Center later this year, and flight tests are scheduled to begin in 2008.

The recent focus by some on demonstrations that prove technologies rather than experiments that expand the boundaries of aeronautical knowledge can be linked to the fact that some in the community have forgotten that the most important product of NASA's aeronautics research is knowledge. Advanced technologies often result from an improvement in our knowledge and understanding; they represent an ability to apply the knowledge that we have gained. But so do computational tools, experimental methods, new scaling laws, and new design tools. A focus on devices rather than on the knowledge that enables them leads to an emphasis on the wrong metrics to assess the quality of aeronautics research. Most notable among these is the "Technology Readiness Level", or TRL.

The TRL simply measures the level of maturity of a particular technology. It does not assess the value of the technology itself. One can develop a device to a very high TRL, but that in no way guarantees that it will successfully transition to industry. Conversely, some of the most widely used "products" that have resulted from NACA/NASA's aeronautics research are items to which one cannot assign a TRL, such as NACA technical reports, computational tools such as OVERFLOW, CFL3D, NASTRAN, and ACES, experimental techniques and methods, and aeronautical design concepts such as the transonic and supersonic area rules. All of these successfully transitioned to the user community and have been used broadly without the use of a TRL metric.

The correct question to ask, then, is not "What is the appropriate TRL for NASA to establish as a goal for technology development to ensure successful transition of its technology?" but rather "How do we ensure that the advances in knowledge, understanding, tools, methods, and technologies developed at NASA transition smoothly and quickly to the broad aeronautics community?" As outlined above, ARMD has developed a comprehensive, four-step approach that we think answers this question.

Finally, there are some who focus on TRLs because they believe that NASA should be required to provide sufficient investment in order to ensure that innovative technologies are developed to a high-enough maturity level so as to guarantee that industry can take them over with minimal risk. We note here what the Commission on the Future of the U.S. Aerospace Industry (2002) stated:

> *"Industry has the responsibility for leveraging government and university research and for transforming it into new products and services, quickly and affordably. But, the U.S. aerospace industry has not invested sufficiently to transition research into marketable products and services."*
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> *"The Commission believes that the U.S. aerospace industry must take the leadership role in transitioning research into products and services for the nation and the world. To assist them, the government must provide industry with insight into its long-term research goals and programs. With this information, the industry needs to develop business strategies that can incorporate this research into new products and services. Industry also needs to provide an input to the government on its research priorities."*

We at NASA believe that our restructured aeronautics program is well aligned with these recommendations. We intend to pursue long-term, cutting-edge research in the core aeronautics disciplines across all flight regimes, in order to enable the quantum leaps in knowledge that lead to the development of revolutionary ideas, concepts, approaches, technologies and capabilities that have broad applicability to the aeronautics community. Such research is appropriate for NASA to conduct, because the pay-off from an economic standpoint is typically uncertain as well as long-term, and the results are not appropriable to a single company.

Ultimately, however, it is up to each company to decide for itself whether to invest in the development of particular concepts and technologies. Removing most or all of the risk for industry to do that removes the influence of market economics. This is indeed a significant distinction between us and other countries. We believe that the free market is the best determination of what technologies should be developed for commercial application, not the Government.

The bottom line is that if we do not focus our research on fundamental aeronautical challenges that will significantly advance our knowledge and understanding, any technology that is developed will look like everything that came before. And large-scale demonstrations that "prove" that such technologies "work" are the surest way to render NASA's aeronautics research program irrelevant.

3) Expanding academic, industry and Government partnerships

The third topic I will address is ARMD's determination to foster close collaboration with researchers at NASA, industry, academia, and other Government agencies in a manner that benefits the aeronautics community broadly. While ARMD has spent much of this year in a planning and reorganization phase, I can report that we are beginning to see the fruits of our labor pay off, particularly in the area of increased and expanded partnerships with research stakeholders. There are several ways in which NASA is reaching out to other aeronautics stakeholders. As outlined above, the RFI and NRA processes are the first way in which we are doing this.

Another way that ARMD is reaching out to stakeholders is through meetings with intellectual leaders in industry and academia. My senior staff and I frequently travel to companies and universities across the country in order to interact with scientists, engineers, and managers who best understand the research challenges of the aeronautics community. Since October 2005, my staff and I have met with more than 30 aeronautics companies, including several visits at company facilities across the country. We have several more such visits planned for this coming year.

ARMD has also begun a series of informal meetings with the aeronautics community that it intends to hold on a regular basis in order to maintain open lines of communication. It is anticipated that aeronautics leaders from industry, academia, industry associations, and non-profit associations will make up the pool of participants for the meetings, with the particular meeting topics determining the make-up of the meeting attendees. These meetings are not intended to generate definitive or consensus recommendations, but to provide participants with a forum to express their various individual points of view as experts in their field.

In addition, ARMD's research programs are using Industry Days as an effective means to reach out to our industry stakeholders. Industry Days are a useful means for industry participants to discuss the particulars of potential pre-competitive research partnerships appropriate for work under Space Act Agreements. The Aviation Safety Program, for example, recently hosted an industry day that drew around 100 participants representing about 25 companies as well as the FAA.

In addition to reaching out to industry stakeholders, NASA is committed to expanding our partnerships with the DoD. On August 7, 2006, NASA signed a Memorandum of Understanding with the U.S. Air Force, making it explicitly clear that we are committed to a partnership that has its roots in some of the greatest aeronautical accomplishments in world history.

Our historical accomplishments include several successful X-vehicle collaborations, including the X-1 and the X-15 mentioned above. Today, our partnership in X-vehicle research continues with the X-51 hypersonics program and the X-48B Blended Wing Body program. We anticipate other opportunities for collaboration on X-vehicle research in the coming months and years.

But NASA's partnership with the Air Force will extend beyond X-vehicles and will include cooperation and collaboration in many important areas of aeronautical research. Clearly, our missions are different and distinct, and neither of us has any intention of performing the other's mission. But we are united in the common goal of the pursuit of the frontiers of flight, and it is in the best interests of the Nation for us to leverage each other's strengths and work together to continue the heritage of remarkable aeronautical achievements that this country has realized. Our collaborations will span all flight regimes from subsonic to hypersonic flight, and will advance our country's mastery of many of the critical elements of aeronautics, including advanced aircraft design, advanced propulsion technology, advanced materials design, and advanced safety technologies, such as resilient aircraft control methods and the ability to detect, predict, and mitigate the aging of aircraft components and systems. We will also work together to ensure that the nation sustains a critical set of aeronautical research and test facilities.

Finally, NASA is committed to working with its Government partners at the JPDO to provide the high-quality, cutting-edge research and technical excellence required to develop the NGATS. Here, we are building on a long history of collaboration with the FAA.

ARMD has interacted closely with the JPDO during the past several months to ensure proper alignment of our research plans with the needs of the NGATS. Specifically, we have solicited input from the JPDO during both our preliminary technical planning last fall and our rigorous proposal review process this past spring. Our thorough proposal review process ensured that the plans were technically credible and well-aligned with the NGATS vision. This level of coordination and cooperation will remain an ongoing element of the ARMD strategic partnership with the JPDO. In addition to conducting research that directly addresses NGATS challenges, we have placed a strong emphasis on active participation in the JPDO, providing personnel, analysis tools, and funding to directly support its functions and activities. NASA is actively involved in all the organizational elements of the JPDO, from the Integrated Product Teams and the Evaluation and Analysis Division up through the Senior Policy Committee, which oversees the work of the JPDO and is chaired by the Secretary of Transportation.

4) Aeronautics funding

Finally, I would like to address the issue of funding for aeronautics research. The FY 2007 President's Budget Request of $724 million for ARMD provides the resources needed to support both institutional requirements and programmatic requirements. Institutional requirements include corporate and center general and administrative costs, and service pools to fund several key functions at the field centers. Programmatic costs support the direct activities for the four programs in this new plan.

As outlined in an August 15, 2006 letter from Administrator Griffin to the Committee, beginning in 2007, NASA plans to manage its Center overhead costs with a single rate for nine Federal Centers. This is a reallocation of Center overhead costs results in full-cost budget changes to all programs and projects and topline changes to all Mission Directorates. This is a budget-neutral change. The amount of funding going to each research Center is unchanged; the amount of funding for direct program and project activity is unchanged; the total amount of funding for overhead is unchanged; as is the total NASA budget.

ARMD's overall budget will decrease by about $200 million under the overhead cost simplification system. But let me be clear, that $200 million was never used for research; it was always set aside to pay the overhead costs of the four research Centers -- costs that will now be shared by all the mission directorates once the Agency's overhead budget as a whole is redistributed. ARMD will still have the same direct buying power. We also will no longer have to pay a large portion of the overhead costs for the four research Centers – Langley, Glenn, Ames and Dryden. The change also puts the research Centers on equal footing with the operational Centers and recognizes them as critical Agency assets, with the Agency itself being held responsible for the health of all ten Centers. Furthermore, the change will enhance transparency of Center expenditures, resulting in improved execution of ARMD programs.

Looking Toward the Future

NASA is excited about the significant milestones in the nation's aeronautics program that will occur this fall, not only in NASA's aeronautics programs, but also in the U.S. aeronautics community as a whole.

First, NASA looks forward to the JPDO's public release of the Enterprise Architecture for NGATS in the near future . We will use this architecture as an additional means to ensure that our aeronautics research programs continue to contribute to the research needs of the Nation's future air transportation system. We also look forward to the Administration's release of the new National Aeronautics Policy in December.

For our part, ARMD hopes to have the first round of NRAs awarded by October through November of 2006. Additionally, the NRA will remain open to enable us to conduct another round of proposal evaluations. ARMD also anticipates finalizing several partnerships with industry through Space Act Agreements. Details regarding established and planned partnerships for each program can be found in the supplementary material. We also anticipate the completion of several technical milestones in many of our projects in the coming weeks and months, such as the testing of the X-51 engine in Langley's 8-foot tunnel, the Critical Design Review of the Hypersonics Boundary Layer Transition Experiment (HyBOLT) with ATK, new techniques for automatically analyzing large amounts of data to detect unsafe trends in a timely manner, and the completion of the Airborne Subscale Transport Aircraft Research (AirSTAR) test bed, which is a subscale fully functioning aircraft that supports research in upset modeling, prevention, and recovery of transport category aircraft.

Lastly, to better meet NASA's mission, ARMD is taking an active role in developing a workforce that will help retain the United States' leadership in aeronautics and astronautics. ARMD sponsored a workshop on June 1, 2006 to explore what can be done to improve the technical capabilities of a workforce to meet the needs of both NASA and the aerospace industry. Workshop participants from government, industry, academia, and professional and industry organizations discussed the future of higher education, and what can be done to better define and fill any gaps in the current education system that might prevent students from pursuing aerospace and aerospace-related careers. Outcomes of the workshop included a number of ideas and concepts, both near-term and long-term, about how we can all work together to improve the size and capability of the future technical workforce.

Following the workshop, ARMD redefined a number of its educational activities to better align with ongoing activities within universities, industry, and outside organizations. ARMD is partnering with these outside organizations by providing technical expertise to help train and educate the future aerospace workforce. These partnering activities include a series of case studies or lessons-learned monographs on aeronautical topics; expansion of its "Beginner's Guide to Aeronautics" Web-based learning to include an updated module on the hypersonic regime; a series of university texts and supplemental materials to fill gaps in the current educational background of university students; support of design competitions that provide university students with hands-on experience in the design and testing of aerospace systems; and better methods for communicating NASA's educational and research opportunities to stakeholders.

Concluding Remarks

ARMD's restructuring has resulted in a total of ten research projects distributed across three programs, as well as a separate program dedicated to the preservation of our key aeronautics test facilities. In order to ensure that our commitment to technical excellence is maintained, we intend to: 1) Provide the details of the technical content of each of our projects on our website; 2) Publish our research results in peer-reviewed journals and NASA Technical Reports; 3) Establish technical working groups within each project to engage industry and academic partners on a regular basis in order to facilitate knowledge transfer; and 4) Conduct annual assessments of our portfolio with the assistance of subject matter experts.

NASA's aeronautics research will advance the frontiers of flight for the benefit of the Nation's civilian, federal, and military communities. In recent years, the emphasis on near-term, product-focused technologies shifted NASA's focus from long-term, cutting-edge research to incremental technology development and "point solutions" to complex challenges. NASA's restructured program ensures long-term focus in fundamental research in both traditional aeronautical disciplines and relevant emerging fields that can be integrated into multidisciplinary system-level capabilities that can be broadly applied. This approach will enable revolutionary change to both the airspace system and the aircraft that fly within it, leading to a safer, more environmentally friendly, and more efficient national air transportation system.

Lisa J. Porter
Associate Administrator for Aeronautics Research

Lisa J. Porter, the Associate Administrator for the Aeronautics Research Mission Directorate, leads the agency's aeronautics research efforts and is co-lead in the development of a national aeronautics policy in cooperation with other government agencies. She most recently served as the NASA Administrator's senior adviser for aeronautics.

Porter came to the agency following her service as senior scientist in the Advanced Technology Office of the Defense Advanced Research Projects Agency in Arlington, Va. While there, she created and managed programs in diverse technical areas ranging from fundamental scientific research to multi-disciplinary systems-level development and integration efforts. Two of her programs focused on developing physics-based predictive design tools that leveraged advanced computational fluid dynamics.

The Helicopter Quieting Program, focused on developing the capability to design quiet rotor blades with minimal impact on aircraft performance. The Friction Drag Reduction Program focused on developing the capability to implement friction drag reduction technologies on naval platforms.

Porter has a bachelor's degree in nuclear engineering from the Massachusetts Institute of Technology, Cambridge, Mass., and a doctorate in applied physics from Stanford University, Calif. She was a lecturer and postdoctoral research associate at MIT. She received the Alpha Nu Sigma MIT Student Chapter Outstanding Teaching Award in 1996. She has authored more than 25 publications in a broad range of technical disciplines including nuclear engineering, solar physics, plasma physics, computational materials modeling, explosives detection and vibration control of flexible structures.

February 2006